# ACTIVITY 21

# TRANSLATING SCIENCE INTO PUBLIC POLICY

In this activity, the students will role-play participants at a panel on climate change and will represent either scientists or policymakers. "Scientists" will use the information they've learned in other classes and assignments to present information to "policymakers," who will weigh that information, develop their own opinions, and decide what—if anything—should be done about climate change. This activity is related to the "Scales, Rules, Standards, Policy, and Science" warm-up and the "Writing Environmental Laws" activity.

## CRITICAL OBJECTIVES

- Research, organize, and present information from the perspective of a scientist or policymaker
- Make informed decisions backed by evidence
- Describe the process and complexity of making policy decisions

## SKILLS

- Researching
- Comparing ideas
- Considering alternatives
- Making decisions

## GUEST PRESENTERS

Guest Presenters for this activity could include EPA Environmental protection specialists, lawyers, research scientists, conservationists, or journalists.

## BACKGROUND

Air quality laws and regulations attempt to govern behavior in order to improve the quality of life for people and protect nature. When people "know" that air pollution causes harm, or when regulations stipulate precise quantities of allowed or illegal pollutants, we take for granted that the numbers are based upon scientific research, and are not just made up. Thus, scientific research plays a major role in supporting laws and policies governing environmental pollution and natural resource management. Scientific research is often categorized into "basic" or "applied" science. Basic, or "pure" research usually refers to fundamental principles that do not have a specific result or application in mind, and is conducted mainly for the sake of improving knowledge. On the other hand, applied research is designed to solve a particular societal or commercial problem or collect information in order

**RELATED WARM-UP**
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**REFER TO READING MATERIALS**
"The Greenhouse Effect"
"Air Pollution"

**TARGET GRADE LEVEL**
8th-11th

**DURATION**
3 class periods (120 minutes), plus library research outside class

**VOCABULARY**
Applied science
Policy
Pure science
Regulations

**MATERIALS**
Flip charts
Blank overhead transparencies
Marking pens
Projector
2-3 sheets of butcher paper
Note pads for student journals

**WORKSHEETS INCLUDED**
6

to enforce specific laws. Sometimes, research is hard to categorize this way, because the results can be both useful to the science in general as well as specifically destined to resolve some commercial or policy-related goal. In general, though, most applied research is based upon sound principles learned from "basic" research. While "policy" usually means government decisions or regulations, it can also include business or personal decisions. Scientists and policymakers each have critical roles to play in translating applied research results into sound government policies and actions. Scientists are trained in recognizing and describing the nature of the physical, chemical, and biological world, and in being able to predict natural behavior from certain facts or data. Scientists are also responsible for communicating their research to non-scientists. They must assist policymakers and others in understanding the relevance of the research, and to recognize the limitations of the conclusions. Scientists do not necessarily tell us what to do. Their role is to tell us what would happen if we did this or that. Policymakers, on the other hand, do more than just listen to scientists. They have to understand the conclusions that the scientists have reached, and they have to understand the limitations of the data. However, they must balance the scientific facts, principles, and uncertainties against social values and economic issues as well. They then have to make often-difficult or controversial public policy decisions. (See reading materials on "The Greenhouse Effect" and "Air Pollution.")

In our system of government, laws, regulations, and policies are generally determined by elected or appointed officials charged with balancing competing interests to the benefit of society or a constituency. In the environmental arena, policymakers usually rely upon recognized scientific or engineering experts to sift through the complex scientific data and (often) competing theories. In the activity below, the students will take the part of policymakers and technical experts in role-playing the type of hearings often held prior to policy decisions.

## WHAT TO DO

### First class

1. Divide the class into two groups. About eight of the students in the first group should be the "policymakers"—Members of Congress and their staff, and the Administrator of the Environmental Protection Agency and her staff—and the remainder of the class will be members of the expert scientific panel. Just as many different areas of scientific expertise are represented in the climate change research community, the "scientist" students should represent different scientific disciplines.
2. Divide the scientists into six or more teams, each representing a different discipline. Student worksheets are provided for the policymaker group and five possible scientist groups, but the students should be encouraged to identify and define additional interest groups (such as citizen groups, lobbies, or additional scientific communities). Team members should be encouraged to research their team's positions at the libraries or by discussions with real experts from government or

the community. You also may want to provide appropriate groups with copies of some of the reading materials included in this package.

3. Discuss with the class the description of each group, what information each group will need, the goals of the panel, and how the panel will be conducted. Stress that the presentations, questions and answers, and discussions are for the purpose of giving policymakers the best available scientific information to help them make decisions. The personal feelings of the scientists should not be allowed to affect the way the scientists present data; however, the conclusions the scientists reach based on those objective data may enter into the discussions.

4. Stress that groups should develop their own conclusions based on the data at their disposal. They may decide, for example, that there is insufficient scientific evidence to be concerned with climate change, or they may decide that the evidence for climate change is very strong and convincing and that severe problems will result. In either case, the scientist groups should be prepared to present their evidence and respond to challenges or questions from the policymakers who may be unconvinced.

5. Policymakers may ask for the scientists' "best professional opinion." The policymakers have to listen carefully to the information, making notes as they proceed, and consider their options. They have a particularly tough job because they have to consider not only the scientific evidence but also the effects their decisions will have on the economic and social welfare of the Nation.

6. Assign each of the scientist teams to prepare a 5-minute summary of the most important issues they want the policymakers to know about. (The presentations are to be made in a follow-up class.) Give them 15-20 minutes to begin deciding what they want to say and what visual aids they will need to support their positions and to select a spokesperson.

7. Have the policy group also select a chairperson, and study and discuss among themselves the list of possible policy options they may wish to consider. They must also consider the nature of the information they need from the scientists, and may wish to formulate questions for each scientist group. Some of the possible policy options include:

   - Business as usual. Insufficient evidence that a problem exists at all.
   - All-out control strategies. Stringent $CO_2$ controls, accelerated reforestation, careful monitoring of planetary health, inter-National cooperation demanded.
   - Small concern. Some energy efficiency improvements,

**TAKE NOTE**

Spend some time helping students consider the economic and social implications of some of these choices.

but wait for more evidence before instituting controls that affect lifestyles.

**Class #2**

1. Arrange the room so the policymakers are sitting at desks or tables facing the class. Set one desk facing the head table, near the center. This will be the "witness table" for the scientists to present their expert testimonies. Arrange the overhead projector, flip charts, or other visual aids nearby, so that everyone can see them. You may add to the official atmosphere by making a poster or banner with "U.S. Panel on Climate Change" printed on it, and by preparing place cards and name tags for each participant.

2. You, the teacher, or the guest presenter could serve as moderator and give opening remarks and introduce the scientist teams and policymakers.

3. Call on each teams' spokesperson to present their 5-minute summaries of the team's research to the policymakers. The teams should be encouraged to keep their presentations within the time limit, and to be very clear and direct in their summary remarks. In presenting their remarks, spokespersons should begin by stating the policy they recommend, and then present the scientific evidence for their position. For example, the Atmospheric Science team might decide to begin by urging immediate, drastic efforts to curb $CO_2$ emissions. They may cite the steady, measurable rise in $CO_2$ across the world and the known physical ability of $CO_2$ to absorb heat as their primary reasons to support the control policy. The policymakers should ask questions during and after the presentations, but the total time for each team should not exceed 8-10 minutes. If the policy group needs more information, they can request that the scientists provide it the following day. All the teams should be able to complete their presentations during this class period.

4. All students should take notes on the presentations in their journals.

**Class #3**

1. Arrange the room as for Class #2

2. Allow about 20 minutes of the class period for the policymakers to confer and make their decisions. During this time, the scientist groups should quietly discuss what might happen if their recommendations were not accepted by the policymakers, and what kind of additional evidence might be important to fill in gaps from their presentations the day before.

3. Have the policy chairperson announce their decisions and their reasons, paying particular attention to missing or weak evidence that they

did not hear from the scientists. One of the policy group should write the decisions and reasons on a flip chart or butcher paper.

4. For the rest of the period, let the class as a whole explore the implications of the decisions, paying attention to the most convincing evidence the policymakers heard. Equal attention should be paid to reasons the policymakers did not accept certain scientific arguments, and whether additional data or evidence that was not heard might have changed the outcome. This consideration, in reality, would be a good reason for additional applied research.

5. Provide a wrap-up during the last five minutes, stressing the difficulties of the decision-making process and explaining that the 3-hour exercise would have taken many months in real life. (You also may choose to have the guest presenter provide the wrap-up.)

## SUGGESTED EXTENSIONS (OPTIONAL)

☼ Have students select aspects of the policy decisions and write a short essay to support or refute the decisions based upon the evidence presented, or upon the need for additional evidence (research).

## SUGGESTED READING


Barke, Richard. *Science, Technology, and Public Policy*. Washington, DC: CQ Press (1986).

Bryner, Gary C. *Blue Skies, Green Politics: The Clean Air Act of 1990*. Washington, DC: CQ Press (1992).

Cushman, John H., Jr. "Clinton to Order Effort To Make Pollution Fairer." *New York Times*, 143 (10 February 1994) p. A1.

Hiskes, Anne L., and Richard P. Hiskes. *Science, Technology, and Policy Decisions*. Boulder, CO: Westview Press (1986).

Hogan, Barbara. "M2/P2...A Better Pollution Control Approach." *Conservationist*, 48 (September 1993) p. 46.

Liroff, Richard A. *Reforming Air Pollution Regulations: The Toil and Trouble of EPA's Bubble*. Washington, DC: Conservation Foundation (1986).

Pringle, Laurence P. *Lives at Stake: The Science and Politics of Environmental Health*. New York, NY: Macmillan Publishers (1980).

Silverberg, Robert. "Greenhouse Effect: Apocalypse Now or Chicken Little." *Omni*, 13 (July 1991) p. 50.

# STUDENT WORKSHEET 1

# TRANSLATING SCIENCE INTO PUBLIC POLICY

## MEMBERS OF CONGRESS AND EPA'S ADMINISTRATOR AND STAFF

As policymakers and lawmakers, you are responsible for assuring that all interests are fairly represented and that no segment or sector of the population is unduly burdened by your decisions. There are, however, many influences on your decisions, and there are many checks and balances to protect the public from abuses of power or authority. Members of Congress, who are elected to represent the majority interests of a part of a single district within a state, may have different priorities and perspectives than the Administrator of the U.S. Environmental Protection Agency, who is responsible to the President for carrying out laws and setting policies Nationwide. Your role here is to determine the forces influencing your decision-making. These forces are outside of the testimony presented by the scientific panels. You should begin with a brief discussion summarizing the different motivations of the members of the group. You may decide to all be Members of Congress, or some of you may also represent the EPA Administrator as her senior policy staff.

You need not find the answers to your questions during the first session. Conduct your own research. Ask the guest presenter (if one was invited), or you may also contact the local office of your own Congressional Representative.

You will need to ask the scientific panelists questions to do your research. Use your questions to get to the root of the problem, and maintain a list of possible solutions as the testimony proceeds.

# STUDENT WORKSHEET 2
# TRANSLATING SCIENCE INTO PUBLIC POLICY
## ATMOSPHERIC SCIENTISTS

Your expertise is primarily in the composition and nature of the atmosphere (chemistry and physics—what's in the air and what the ingredients do), and the influence of the atmosphere on climate.

Clues for research: Atmospheric scientists could be expected to provide expert testimony on the greenhouse effect, what greenhouse gases are, how they are changing the atmosphere, and how that might affect climate over the short- and long term.

## STUDENT WORKSHEET 3

# TRANSLATING SCIENCE INTO PUBLIC POLICY

### ECOLOGISTS

Your expertise is in the structure and function of the Earth's living things; how plants and animals are distributed across the landscape, how they interact with each other and with the Earth's environment, and how plants and animals "make their livings."

Clues for research: Ecologists may provide expert opinions on the way climate influences important ecosystems, how changes in habitat may affect plants and animals, and how and why future climate changes might affect ecosystems.

# STUDENT WORKSHEET 4

# TRANSLATING SCIENCE INTO PUBLIC POLICY

## AGRICULTURAL SCIENTISTS

You are primarily interested in crop plants and their production in commercial quantities. You deal with issues of crop health and stress, soil fertility, water availability, farming practices, pesticides and fertilizers, and with economic issues affecting farms and food production.

Clues for research: Agricultural scientists would be expected to testify about the possible impacts of climate upon food production and food distribution.

# STUDENT WORKSHEET 5
# TRANSLATING SCIENCE INTO PUBLIC POLICY
## OCEANOGRAPHERS

You specialize in the physical and chemical makeup of the oceans, how they circulate, how they interact with the atmosphere, how they influence the Earth's climate, and how they store and exchange energy with the atmosphere. Oceanographers also are concerned with the biology of the seas, and with fisheries.

Clues for research: Oceanographers would be expected to provide information on the interactions of oceans with climate, the possibilities of sea-level rise, and the impacts of changing climate upon oceanic and coastal life.

# STUDENT WORKSHEET 6

# TRANSLATING SCIENCE INTO PUBLIC POLICY

## COMPUTER MODELERS AND MATHEMATICIANS

You are experts in producing complex computer simulations of natural physical and biological processes, often with hundreds of variables. These simulations can be used to predict the behavior of natural systems (such as climate) that cannot easily be experimented upon directly.

Clues for research: Computer modelers may give expert testimony on the way computer models are used to help the scientific community make predictions, and to discuss the strengths and limitations of these models and their data.